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Atmospheric predictors for annual maximum precipitation in North Africa

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ATMOSPHERIC PREDICTORS FOR ANNUAL MAXIMUM PRECIPITATION IN NORTH AFRICA

Abstract

The high precipitation variability over North Africa presents a major challenge for the population and the infrastructures in the region. The last decades have seen many flood events caused by extreme precipitation occurring in this area. Prior to the development of downscaling models to evaluate the possible climate change impacts on extreme precipitation, there is a need to identify the most relevant atmospheric predictors to model these extreme events. In this work, the effect of 14 different variables calculated from NCEP reanalyses from daily to seasonal time steps on the maximal annual daily precipitation (MAP) is evaluated at 6 coastal stations located in North Africa (Larache, Tangiers, Mellila, Algiers, Tunis and Gabes). The GEV-B-Spline model has been used to detect this influence. This model considers all dependence forms (linear, quadratic..) between the covariates and the variable of interest thus providing a very flexible framework to evaluate the covariate effects on the GEV model parameters. The estimation of the parameters of GEV-B-Spline model is done in a Bayesian framework. A Markov Chain Monte Carlo (MCMC) algorithm has been developed to estimate quantiles and their posterior distributions. The results show that not a single set of covariates is valid for all stations. Overall a strong dependence between the NCEP covariates and MAP is detected, in particular with covariates describing large scale circulation (geopotential heights) or moisture (humidity). Therefore this study provides insights for developing downscaling models for extreme precipitation tailored for North African conditions.